Trigonometry Word Problems Using SOH CAH TOA

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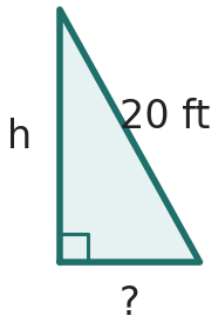
Name: _____ Date: _____ Score: / 10

Learning Objectives

- Identify which trig ratio (sine, cosine, or tangent) applies to a given right-triangle word problem
- Set up and solve equations using SOH CAH TOA to find missing sides or angles
- Apply right-triangle trigonometry to real-life situations involving angles of elevation and depression

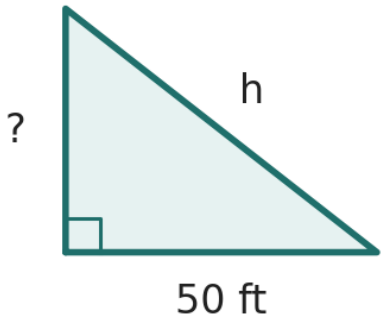
Use SOH CAH TOA to solve each right-triangle word problem; round final answers to the nearest tenth.

1. A 20 ft ladder leans against a wall making a 65° angle with the ground. How high up the wall does the ladder reach?



Answer: _____

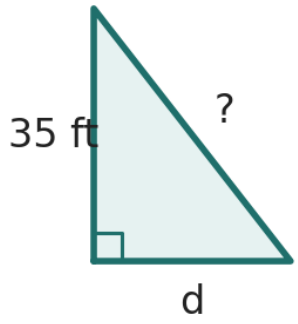
2. From a point on level ground 50 ft from the base of a flagpole, the angle of elevation to the top of the pole is 38°. Find the height of the flagpole.



Answer: _____

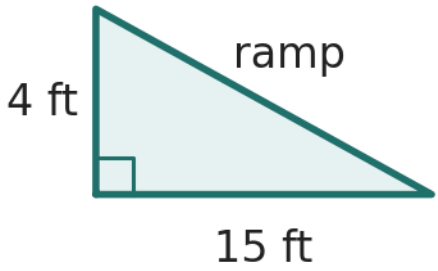
Scan to watch

3. A guy wire is attached to the top of a 35 ft tower and anchored to the ground at an angle of 52° with the ground. How long is the guy wire?



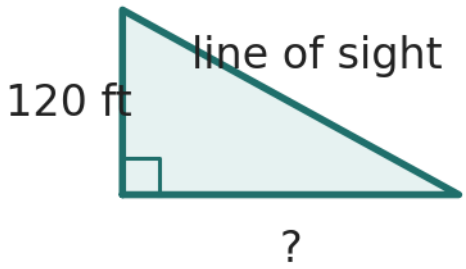
Answer: _____

4. A ramp rises 4 ft over a horizontal distance of 15 ft. Find the angle the ramp makes with the ground.



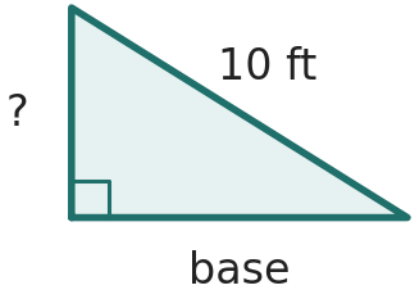
Answer: _____

5. From the top of a 120 ft cliff, the angle of depression to a boat at sea is 25°. How far is the boat from the base of the cliff?



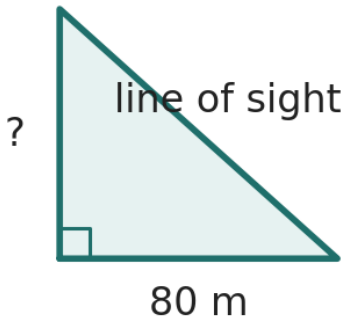
Answer: _____

6. A 10 ft slide makes a 32° angle with the ground. How tall is the platform at the top of the slide?



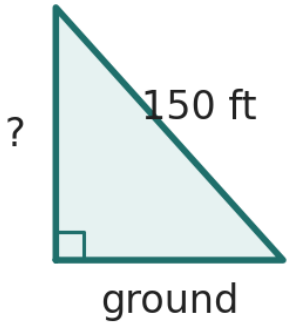
Answer: _____

7. An observer stands 80 m from a building. The angle of elevation to the top of the building is 42°. Find the height of the building.



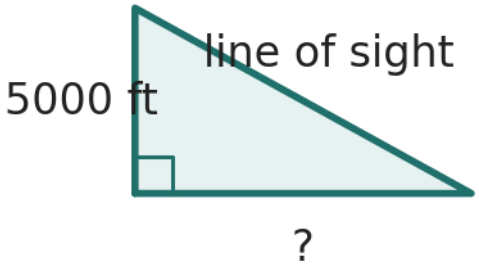
Answer: _____

8. A kite string is 150 ft long and makes a 48° angle with the ground. How high is the kite above the ground (assuming the string is straight)?



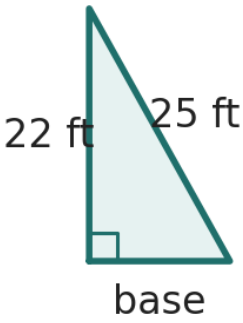
Answer: _____

9. A plane is flying at an altitude of 5,000 ft. The pilot sees an airport at an angle of depression of 15°. Find the horizontal distance from the plane to the airport.



Answer: _____

10. A 25 ft ladder reaches 22 ft up a wall. Find the angle the ladder makes with the ground.



Answer: _____

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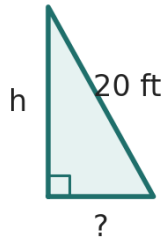
ANSWER KEY & SOLUTIONS

Encourage students to sketch the right triangle, label the opposite/adjacent/hypotenuse relative to the given angle, then choose the correct ratio.

Solutions

1. A 20 ft ladder leans against a wall making a 65° angle with the ground. How high up the wall does the ladder reach?



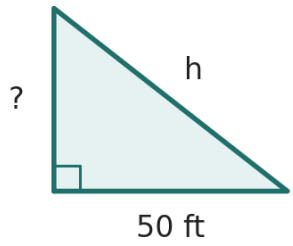
→ *The wall side is opposite the 65° angle and the ladder is the hypotenuse, so use sine.*

→ *Write sin(65°) = h / 20, giving h = 20 · sin(65°).*

→ *Compute h ≈ 20 · 0.9063 ≈ 18.1 ft.*

Answer: ≈ 18.1 ft

2. From a point on level ground 50 ft from the base of a flagpole, the angle of elevation to the top of the pole is 38°. Find the height of the flagpole.



→ *The 50 ft distance is adjacent to the 38° angle and the height is opposite, so use tangent.*

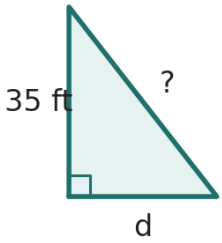
→ *Write tan(38°) = h / 50, giving h = 50 · tan(38°).*

→ *Compute h ≈ 50 · 0.7813 ≈ 39.1 ft.*

Answer: ≈ 39.1 ft

Scan to watch

3. A guy wire is attached to the top of a 35 ft tower and anchored to the ground at an angle of 52° with the ground. How long is the guy wire?



→ *The 35 ft tower is opposite the 52° angle and the wire is the hypotenuse, so use sine.*
→ *Write sin(52°) = 35 / L, giving L = 35 / sin(52°).*
→ *Compute L ≈ 35 / 0.7880 ≈ 44.4 ft.*

Answer: ≈ 44.4 ft

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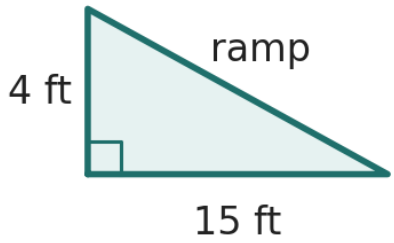
4. A ramp rises 4 ft over a horizontal distance of 15 ft. Find the angle the ramp makes with the ground.



→ *The rise (4 ft) is opposite the angle and the run (15 ft) is adjacent, so use tangent.*
→ *Write tan(θ) = 4/15, giving θ = arctan(4/15).*
→ *Compute θ ≈ arctan(0.2667) ≈ 14.9°.*

Answer: $\theta \approx 14.9^\circ$

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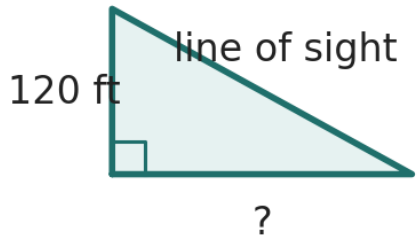
5. From the top of a 120 ft cliff, the angle of depression to a boat at sea is 25°. How far is the boat from the base of the cliff?



→ *The angle of depression equals the angle of elevation from the boat, so the 25° angle has the 120 ft cliff opposite and the horizontal distance adjacent.*
→ *Write tan(25°) = 120 / d, giving d = 120 / tan(25°).*
→ *Compute d ≈ 120 / 0.4663 ≈ 257.3 ft.*

Answer: ≈ 257.3 ft

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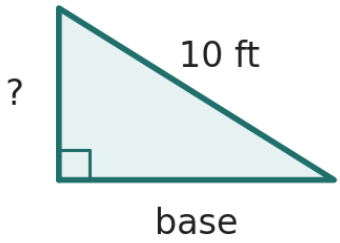
6. A 10 ft slide makes a 32° angle with the ground. How tall is the platform at the top of the slide?



→ *The platform height is opposite the 32° angle and the slide is the hypotenuse, so use sine.*
→ *Write sin(32°) = h / 10, giving h = 10 · sin(32°).*
→ *Compute h ≈ 10 · 0.5299 ≈ 5.3 ft.*

Answer: ≈ 5.3 ft

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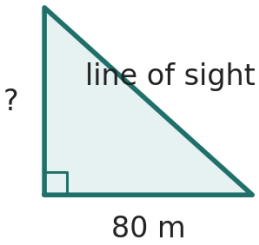
7. An observer stands 80 m from a building. The angle of elevation to the top of the building is 42°. Find the height of the building.



→ *The 80 m distance is adjacent to the 42° angle and the height is opposite, so use tangent.*
→ *Write tan(42°) = h / 80, giving h = 80 · tan(42°).*
→ *Compute h ≈ 80 · 0.9004 ≈ 72.0 m.*

Answer: ≈ 72.0 m

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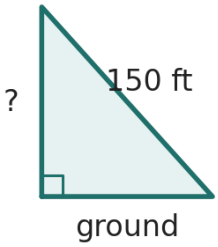
8. A kite string is 150 ft long and makes a 48° angle with the ground. How high is the kite above the ground (assuming the string is straight)?



→ *The height is opposite the 48° angle and the string is the hypotenuse, so use sine.*
→ *Write sin(48°) = h / 150, giving h = 150 · sin(48°).*
→ *Compute h ≈ 150 · 0.7431 ≈ 111.5 ft.*

Answer: ≈ 111.5 ft

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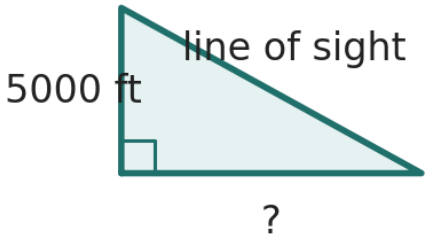
9. A plane is flying at an altitude of 5,000 ft. The pilot sees an airport at an angle of depression of 15°. Find the horizontal distance from the plane to the airport.



→ *The 5,000 ft altitude is opposite the 15° angle (equal to the angle of elevation from the airport) and the horizontal distance is adjacent, so use tangent.*

→ *Write tan(15°) = 5000 / d, giving d = 5000 / tan(15°).*

→ *Compute d ≈ 5000 / 0.2679 ≈ 18,660 ft.*

Answer: $\approx 18\,660$ ft

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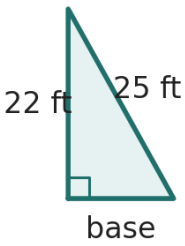
10. A 25 ft ladder reaches 22 ft up a wall. Find the angle the ladder makes with the ground.



→ *The 22 ft height is opposite the angle and the 25 ft ladder is the hypotenuse, so use sine.*

→ *Write sin(θ) = 22/25, giving θ = arcsin(22/25).*

→ *Compute θ ≈ arcsin(0.88) ≈ 61.6°.*

Answer: $\theta \approx 61.6^\circ$

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